ORDER FOR SUPPLIES OR SERVICES

PAGE 1 OF PAGES 13

IMPORTANT: Mark all packages and papers with contract and/or order numbers.

1. DATE OF ORDER	2. CONTRACT NO. (If any)
02/28/2014	EP-C-11-036

3. ORDER NO.	4. REQUISITION/REFERENCE NO.
0017	PR-ORD-13-02746

5. ISSUING OFFICE (Address correspondence to)
CPOD
US Environmental Protection Agency
26 West Martin Luther King Drive
Mail Code: NWD
Cincinnati OH 45268

6. SHIP TO:
a. NAME OF CONSIGNEE
CPOD
b. STREET ADDRESS
US Environmental Protection Agency
26 West Martin Luther King Drive
Mail Code: NWD

c. CITY	d. STATE	e. ZIP CODE
Cincinnati	OH	45268

7. TO:
a. NAME OF CONTRACTOR
R T I INTERNATIONAL
b. COMPANY NAME
c. STREET ADDRESS
PO BOX 12194

d. CITY	e. STATE	f. ZIP CODE
RESEARCH TRIANGLE PARK	NC	277092194

f. SHIP VIA

8. TYPE OF ORDER
☐ a. PURCHASE
REFERENCE YOUR:
Please furnish the following on the terms and conditions specified on both sides of this order and on the attached sheet, if any, including delivery as indicated.

☒ b. DELIVERY
Except for billing instructions on the reverse, this delivery order is subject to instructions contained on this side only of this form and is issued subject to the terms and conditions of the above-numbered contract.

9. ACCOUNTING AND APPROPRIATION DATA	10. REQUISITIONING OFFICE
See Schedule	CPOD

11. BUSINESS CLASSIFICATION (Check appropriate box(es))
☐ a. SMALL ☒ b. OTHER THAN SMALL ☐ c. DISADVANTAGED ☐ d. WOMEN-OWNED ☐ e. HUBZone
☐ f. SERVICE-DISABLED VETERAN-OWNED ☐ g. WOMEN-OWNED SMALL BUSINESS (WOSB) ELIGIBLE UNDER THE WOSB PROGRAM ☐ h. EDWOSB

12. F.O.B. POINT
Destination

13. PLACE OF		14. GOVERNMENT B/L NO.	15. DELIVER TO F.O.B. POINT ON OR BEFORE (Date)	16. DISCOUNT TERMS
a. INSPECTION	b. ACCEPTANCE			
Destination	Destination			

17. SCHEDULE (See reverse for Rejections)

ITEM NO. (a)	SUPPLIES OR SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)
	Tax ID Number (b)(4) DUNS Number: Critical Loads, Nitrogen Deposition, and Climate Change: Impacts on Ecosystems and Scenarios of Response TOPO: Christopher Clark Continued ...					

18. SHIPPING POINT	19. GROSS SHIPPING WEIGHT	20. INVOICE NO.	17(h) TOTAL (Cont. pages)

21. MAIL INVOICE TO:

SEE BILLING INSTRUCTIONS ON REVERSE

a. NAME: RTP Finance Center — $119,899.94

b. STREET ADDRESS (or P.O. Box): US Environmental Protection Agency
RTP-Finance Center
Mail Drop D143-02
109 TW Alexander Drive

17(i) GRAND TOTAL: $139,376.00

c. CITY	d. STATE	e. ZIP CODE
Durham	NC	27711

22. UNITED STATES OF AMERICA BY (Signature)		23. NAME (Typed)
02/28/2014 Camille W. Davis ELECTRONIC SIGNATURE		Camille W. Davis TITLE: CONTRACTING/ORDERING OFFICER

AUTHORIZED FOR LOCAL REPRODUCTION
PREVIOUS EDITION NOT USABLE

OPTIONAL FORM 347 (Rev. 2/2012)
Prescribed by GSA/FAR 48 CFR 53.213(f)

IMPORTANT: Mark all packages and papers with contract and/or order numbers.

DATE OF ORDER	CONTRACT NO.	ORDER NO.
02/28/2014	EP-C-11-036	0017

ITEM NO. (a)	SUPPLIES/SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)
	Admin Office: CPOD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268 Accounting Info: 13-14-C-262H000-101FK6XR1-2532--26A5C-13262HC105-001 BFY: 13 EFY: 14 Fund: C Budget Org: 262H000 Program (PRC): 101FK6XR1 Budget (BOC): 2532 Cost: 26A5C DCN - Line ID: 13262HC105-001 Period of Performance: 03/03/2014 to 05/31/2015					
0001	Critical Loads, Nitrogen Deposition, and Climate Change: Impacts on Ecosystems and Scenarios of Response Award Type: Cost-plus-fixed-fee Total Estimated Cost: $(b)(4) Fixed Fee: $(b)(4) Completion Form The obligated amount of award: $119,899.94. The total for this award is shown in box 17(i).				119,899.94	

TOTAL CARRIED FORWARD TO 1ST PAGE (ITEM 17(H)) $119,899.94

PERFORMANCE WORK STATEMENT
STREAMS II
Task Order 0017, RTI EP-C-11-036

TITLE: Critical Loads, Nitrogen Deposition, and Climate Change: Impacts on Ecosystems and Scenarios of Response

Task Order Manager (TOM)	**Alternate Task Order Manager (ATOM)**
Name: Christopher M Clark	Name: Britta Bierwagen
Office: ORD/NCEA/GCAS	Office: ORD/NCEA/GCAS
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Phone: 703-347-8665	Phone: 703-347-8613
Fax: 703-347-8694	Fax: 703-347-8694
Email: Clark.Christopher@epa.gov	Email: Bierwagen.Britta@epa.gov

PERIOD OF PERFORMANCE: February 28, 2014 though May 31, 2015. A 1-year Option may be exercised after the initial period.

EPA GLOBAL CHANGE RESEARCH PROGRAM

EPA's Global Change Impacts and Adaptation program, as part of the ORD Global Change Research Program (GCRP) within the National Center for Environmental Assessment (NCEA), assesses the potential vulnerability to climate change (and other global change stressors such as land-use change and nitrogen deposition) of EPA's air, water, ecosystem, and human health protection efforts at the federal, regional, state, municipal, and tribal levels, as well as adaptation options to build resilience in the face of these vulnerabilities. We carry out interdisciplinary syntheses across newly emerging scientific findings to identify potential impacts and characterize and communicate the uncertainty in the science to provide support for decision makers and managers.

BACKGROUND

Many global change factors resulting from human activity simultaneously stress ecosystems and the ecosystem services they provide to humans. Evaluation of the effects of individual stressors is important to setting U.S. environmental policy; however the net effects of multiple stressors is critical to inform policy decisions aimed at sustaining healthy ecosystem structure and function. Critical loads (CLs) are defined as "a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge'' (Bobbink et al. 2010). They are a useful policy instrument that have been used to manage air pollution from nitrogen deposition in Europe and to a lesser extent in North America under the United Nation's Convention on Long-Range Transboundary Air Pollution (Dise 2011). Until recently, quantitative data on critical loads in the United States was insufficient for broad scale estimates of interactive impacts from climate change and nitrogen deposition in the United States. However, a recent national assessment spearheaded by the US Forest Service and the US Environmental Protection Agency generated empirical critical loads of nitrogen deposition for various ecological receptors across the United States, including for nitrate leaching, changes in biodiversity, surface water acidification, soil acidification, and other ecological receptors (McNulty et al. 2007, Pardo et al. 2011a, Pardo et al. 2011b, Moore and Lynch 2012).

The objective of this research is two-fold: (1) to compare the interactive impacts of nitrogen (and sulfur) deposition and climate change with various CL estimates for the US; and (2) examine various emission reduction scenarios to compare their efficacy in reducing deposition (N and S) below various CLs. This will involve integrating emission and transport/deposition models (e.g. SMOKE and CMAQ), with georeferenced CL estimates, across a suite of emission and CL scenarios.

RELATED AND SUPPORTING GCRP PROJECTS

In order to facilitate integrated assessments using climate change projections, the EPA GCRP has incorporated model output from several efforts into a geographic information system (GIS). The first set of data come from the North American Regional Climate Change Assessment Project (NARCCAP; http://www.narccap.ucar.edu/), a multi-institution cooperative effort, managed by the National Center for Atmospheric Research (NCAR), to use state-of-the-art Regional Climate Models (RCMs) at a number of U.S. and international institutions to dynamically downscale output from the most recent IPCC Global Climate Model (GCM) simulations to a much higher resolution (i.e., 50-km horizontal grid spacing and 3-hourly data archival) over the U.S., most of Canada, and part of Mexico for present-day (1970-2000) and future (2040-2070) decades. The second set of data are from the Bureau of Reclamation, who compiled Bias-Corrected Spatial Disaggregated climate data for the contiguous US from 2000-2100 (BCSD; http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/dcpInterface.html#Welcome) at a 1/8 degree resolution using statistical downscaling. These datasets will be made available if necessary by EPA GCRP for this Task Order.

PURPOSE OF THIS TASK ORDER

The purpose of this Task Order (TO) is to examine whether N and S emissions and subsequent deposition are above or below various sets of critical loads, understand how climate change may alter these exposures, and explore the potential for reducing deposition through various hypothetical emission-reduction scenarios. This TO is also for processing and formatting the dataset to be distributed to EPA and the public.

REQUIRED CONTRACTOR QUALIFICATIONS

1) Multidisciplinary professional expertise in air quality modeling, scenario development, critical loads, and other related fields.

2) Experience with air quality models such as emission inventory models (e.g. SMOKE), and atmospheric dynamics models (CMAQ, and/or CMAQ-DDM-3D). Experience includes model setup, data acquisition and formatting, model calibration and validation, sensitivity analyses, scripting or other programming techniques to automate large modeling tasks, and the application of quality control checks and measures to ensure the validity of model simulations.

3) Experience with GIS and spatial statistical analyses.

4) Experience developing, managing, and ensuring quality control of large datasets.

5) Experience preparing technical reports and papers written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

DESCRIPTION OF TASKS

TASK 1: Establish Communication and Develop a Quality Assurance Project Plan

The Contractor shall contact the TOM and schedule a kickoff project meeting. In collaboration with the TOM, the Contractor shall also establish a schedule for regular progress reports (e.g. one (1) phone call per month for one (1) hour), project meetings, and other communications throughout the period of performance of this Task Order.

Deliverable 1.1: Brief, written progress reports as email to the TOM. Due monthly or upon request by the TOM for the duration of this Task Order.

Deliverable 1.2: Project meetings and other communications, such as conference calls, as needed. Due upon request by the TOM for the duration of this Task Order.

All work conducted under this Task Order shall be performed pursuant to an EPA-approved Quality Assurance Project Plan (QAPP). The contractor shall develop a single QAPP within 30 days after project start for review and approval by the TOM and the EPA QA Officer. The QAPP shall outline the approach and measures the Contractor will implement to ensure a high standard of quality in data analysis and written deliverables. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). Portions of this Task Order relevant to modeling will reference *Guidance for Quality Assurance Project Plans for Modeling* (EPA QA/G-5M), while portions of this Task Order relevant to geospatial data will reference *Guidance for Quality Assurance Project Plans for Geospatial Data* (EPA QA/G-5G). Elements from these sources will be used to derive a single QAPP for this Task Order. All electronic deliverables (i.e., computer files) shall be submitted in a format acceptable to EPA.

The contractor shall not incur billable costs for QA-related work until receiving IN WRITING from the EPA Task Order Manager that EPA has approved the QAPP.

Deliverable 1.3: A draft QAPP submitted to the TOM for review. Due three (3) weeks after Task Order award.

Deliverable 1.4: A revised QAPP addressing the TOM and QA Officer's comments on the QAPP. Due one (1) week after receiving comments from the TOM.

TASK 2: Simulation of Contemporary Deposition Levels to Ecosystems and Comparison with Critical Loads

The Contractor shall simulate the emission of pollutants (esp. N and S), their transport, potential transformation, and final deposition to the land-water surface. Ideally, the Contractor will use the coupled modeling system SMOKE-CMAQ to perform this function, though other platforms will be considered. If previous runs of SMOKE-CMAQ are available for use, that is preferred to minimize redundant efforts. Task 2 should cover the entire lower 48 states of the U.S.; however, Contractors may propose, instead, to focus on specific regions as long as the regions represent a diversity of cases. For example, EPA would accept a proposal that examined three (3) regions/cases: (i) a region dominated by stationary source pollution (e.g. the Northeast); (ii) a region dominated by mobile source pollution (e.g. the Southwest); and (iii) a region dominated by

agricultural pollution (e.g. the Midwest). A diversity of cases will facilitate exploring reduction scenarios from a variety of source categories.

Since effects from N and S deposition to ecosystems occur over long time periods, and since N and S deposition have been occurring for decades, the Contractor shall propose a temporal modeling domain that incorporates this longevity. The Contractor shall use emission inventories (e.g. from SMOKE) that represent current emissions. If possible, these should be attenuated to the past to represent historical emissions. This could be performed through a complicated annual inventory- building effort, or through simple regression to the past in a manner similar to earlier studies (e.g. (Baron 2006)). Alternatively, the Contractor can propose to hindcast deposition rather than emission, which might be simpler given the greater availability of historical meteorology as opposed to historical emissions.

The Contractor shall compare these deposition profiles through time with published critical loads (McNulty et al. 2007, Pardo et al. 2011a, Pardo et al. 2011b, Moore and Lynch 2012) though the calculation of "exceedances" (exceedance = deposition – CL). For example, maps could depict the amount of deposition above each individual CL (i.e. empirical changes for herbaceous biodiversity, changes in lichen biodiversity), or, the percentage of years that the deposition was above any CL for that grid cell. The GIS maps derived from the analysis will be determined in consultation with the COR. An example of these CLs are shown below in Table 1 for the Northeastern Forests.

Table 1: Critical Loads for the Northern Hardwood Forests

Ecological Effect	Critical Load (kg N ha-1 yr-1)	Source
Increased NO3- leaching in surface water	8	Aber et al 2003
Tree growth and mortality	18	McNulty et al 2005
Decreased growth and survivorship of northern forest tree species	3	Thomas et al 2010
Changes in cover of herbaceous species	14	Hurd et al 1998
Changes in community composition of lichens	5	Geiser et al 2010

A sensitivity analysis should be proposed on current deposition to determine the "source" of the deposition exceedances. Ideally, this could be done using computationally efficient tools such as CMAQ-DDM-3D (Napelenok et al. 2008), though other proposed methods will be considered.

Deliverable 2.1: A draft Memo describing the analytical approach. This should include specifying regional domain(s), time period, hindcasting procedure, sensitivity analysis protocol, and emission inventory(s). Due six (6) weeks after Deliverable 1.4.

Deliverable 2.2: A final Memo describing the analytical approach. This should address TOM comments on Deliverable 2.1. Due two (2) weeks after receiving TOM comments on Deliverable 2.1.

Deliverable 2.3: A Memo reporting execution of the model runs. Due eight (8) weeks after receiving TOM comments on Deliverable 2.2.

TASK 3: Simulation of Future Deposition and Reduction Scenarios

Once current and historical N and S deposition have been estimated (Task 2), the Contractor will extend the modeling domain to the future (Task 3). This will include a time horizon out to midcentury (e.g. 2050), when changes in climate from different SRES scenarios are more apparent. Three (3) future climate scenarios should be included representing a "best case", "worst case", and "intermediate case" for climate change.

Future simulations should also include emission reduction scenarios, one of which should be a "Baseline" that represents current policy and inventory. At least five (5) other scenarios should be proposed, that represent realistic reductions for each industry (stationary sources, mobile sources, agriculture). Scenarios should also be developed that are region-specific. For example, emission reduction scenarios should focus on the dominant source (e.g. stationary sources for the Northeast). The Contractor can propose other criteria to determine reduction scenarios (e.g. economic efficiency). Data on meteorology will also be needed to run simulations into the future. Decisions on reduction scenarios and future meteorology will be developed in consultation with the TOM.

As in Task 2, a sensitivity analysis (e.g. using CMAQ-DDM-3D) should be proposed to identify the source of deposition and explore the ramifications for reducing deposition below different target CLs.

Deliverable 3.1: A draft Memo describing the analytical approach. This should include identifying the time horizon to be modeled, describing the scenarios of emission reduction, and defining the source(s) of future meteorology. Due six (6) weeks after Deliverable 2.3.

Deliverable 3.2: A final Memo describing the analytical approach. This should address TOM comments on Deliverable 3.1. Due two (2) weeks after receiving TOM comments on Deliverable 3.1.

Deliverable 3.3: A Memo reporting execution of the model runs. Due eight (8) weeks after receiving TOM comments on Deliverable 3.2.

TASK 4: Prepare a Final Report

The Contractor shall prepare a written, comprehensive Final Report, consistent with EPA guidelines, presenting and discussing the goals, methods, results, and conclusions of estimating the interactive effects from climate and nitrogen deposition on forest composition and ecosystem services. The final report shall be written in a format specified by the TOM, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 4.1: A proposed outline for a written, comprehensive final report presenting and discussing the goals, methods, results, and conclusions of this Task Order submitted to the TOM for approval. Due two (2) weeks after the approval of Deliverable 3.3.

Deliverable 4.2: A first draft written, comprehensive final report presenting and discussing the goals, methods, results, and conclusions of this Task Order submitted to the TOM for approval. Due eight (8) weeks after approval of Deliverable 4.1.

Deliverable 4.3: A second draft written, comprehensive final report submitted to the TOM. Due eight (8) weeks after approval of Deliverable 4.2.

Deliverable 4.4: A final draft written, comprehensive final report submitted to the TOM. The revised final report shall be written in a format specified by the TOM, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. Due four (4) weeks after approval of Deliverable 4.3

TASK 5: Provide all Modeling Output Files and Scripts for Future Use

The Contractor shall provide to the TOM all modeling output generated in this Task Order as digital computer files. The data shall be provided in a digital format specified by the TOM on an external hard drive with sufficient storage memory for storing all necessary files. The Contractor shall organize model output files in a directory and using a file-naming convention agreed upon by the TOM.

Deliverable 5: An external hard drive containing all modeling output data as digital computer files in a file directory and using a file-naming convention specified by the TOM. Due four (4) weeks after approval of Deliverable 4.4.

TASK 6 (OPTIONAL TASK): Prepare a Journal Manuscript

If the Optional task is exercised, the Contractor shall prepare a written manuscript in a concise format to be submitted for publication in peer reviewed scientific journal summarizing the potential impacts of climate and nitrogen deposition on forest composition and ecosystem services. The manuscript shall be written in the format of a peer reviewed scientific journal such as Science, Nature, or some other respected journal (to be specified by the TOM), and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 6.1: A proposed outline for a manuscript summarizing the potential impacts of climate and nitrogen deposition on forest tree composition and ecosystem services submitted to the TOM for approval. Due two (2) weeks after the approval of Deliverable 5.

Deliverable 6.2: A first draft manuscript summarizing the potential impacts of climate and nitrogen deposition on forest tree composition and ecosystem services submitted to the TOM for approval. Due eight (8) weeks after the approval of Deliverable 6.1.

Deliverable 6.3: A second draft manuscript addressing TOM comments on the first draft submitted to the TOM for internal EPA peer review. Due eight (8) weeks after approval of Deliverable 6.2.

Deliverable 6.4: A final draft manuscript addressing internal EPA peer review comments submitted to the TOM. The revised manuscript shall be written in a format specified by the TOM, and be written in clear, concise prose consistent with the standards

of peer reviewed scientific literature. Due four (4) weeks after approval of Deliverable 6.3

SCHEDULE OF BENCHMARKS & DELIVERABLES:

Task No.	DELIVERABLE	Incremental Schedule	Gross Schedule Weeks
1	**1.1** Brief, written progress reports as email to the TOM.	Due monthly or upon request by the TOM for the duration of this Task Order.	NA
1	**1.2.** Project meetings and other communications, such as conference calls, as needed.	Due upon request by the TOM for the duration of this Task Order.	NA
1	**1.3.** A draft QAPP submitted to the TOM for review.	Due three (3) weeks after being issued the Task Order.	3
1	**1.4.** A revised QAPP addressing TOM's and QA officer's comments on the QAPP.	Due one (1) week after receiving comments from the TOM.	4
2	**2.1.** A draft Memo describing the analytical approach. This should include specifying regional domain(s), time period, hindcasting procedure, sensitivity analysis protocol, and emission inventory(s).	Due six (6) weeks after Deliverable 1.4.	10
2	**2.2.** A final Memo describing the analytical approach. This should address TOM comments on Deliverable 2.1.	Due two (2) weeks after receiving TOM comments on Deliverable 2.1.	12
2	**2.3.** A Memo reporting execution of the model runs.	Due eight (8) weeks after receiving TOM comments on Deliverable 2.2.	20
3	**3.1.** A draft Memo describing the analytical approach. This should include identifying the time horizon to be modeled, describing the scenarios of emission reduction, and defining the source(s) of future meteorology.	Due six (6) weeks after Deliverable 2.3.	26
3	**3.2.** A final Memo describing the analytical approach. This should address TOM comments on Deliverable 3.1.	Due two (2) weeks after receiving TOM comments on Deliverable 3.1.	28
3	**3.3.** A Memo reporting execution of the model runs.	Due eight (8) weeks after receiving TOM comments on Deliverable 3.2.	36

4	**4.1** A proposed outline for a written, comprehensive final report presenting and discussing the goals, methods, results, and conclusions of this Task Order submitted to the TOM for approval.	Due two (2) weeks after the approval of Deliverable 3.3.	38
4	**4.2** A first draft written, comprehensive final report presenting and discussing the goals, methods, results, and conclusions of this Task Order submitted to the TOM for approval.	Due eight (8) weeks after approval of Deliverable 4.1.	46
4	**4.3.** A second draft written, comprehensive final report submitted to the TOM.	Due eight ( )8 weeks after approval of Deliverable 4.2.	54
4	**4.4.** A final draft written, comprehensive final report submitted to the TOM. The revised final report shall be written in a format specified by the TOM, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.	Due four (4) weeks after approval of Deliverable 4.3	58
5	**5.1.** An external hard drive containing all modeling output data as digital computer files in a file directory and using a file-naming convention specified by the TOM.	Due four (4) weeks after approval of Deliverable 4.4.	84
6*	**6.1.** A proposed outline for a manuscript summarizing the potential impacts of climate and nitrogen deposition on forest tree composition and ecosystem services submitted to the TOM for approval.	Due two (2) weeks after the approval of Deliverable 5.	60
6*	**6.2.** A first draft written manuscript summarizing the potential impacts of climate and nitrogen deposition on forest tree composition and ecosystem services submitted to the TOM for approval.	Due eight (8) weeks after the approval of Deliverable 6.1.	68
6*	**6.3.** A second draft written manuscript addressing TOM comments on the first draft submitted to the TOM for internal EPA peer review.	Due eight (8) weeks after approval of Deliverable 6.2.	76

6*	**6.4.** A final draft manuscript addressing internal EPA peer review comments submitted to the TOM. The revised manuscript shall be written in a format specified by the TOM, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.	Due four (4) weeks after approval of Deliverable 6.3.	80

***Task 6 is an Optional task.**

NOTE: The gross schedule assuming a one (1) week average turnaround from TOM to review and comment on Deliverables (excluding Deliverables 1.1 and 1.2) adds 20 weeks to the calendar for a total gross of 104 weeks for completion of the TO.

REPORTING

All documentation and reporting under this Task Order shall be in compliance with contract requirements. See contract clause F.2, F.3, and J.2 "List of Attachments, Number 2 - Reports of Work".

Additional requirements specific to this Task Order are as follows:

> Electronic deliverables must be in an original file format that can be supported by EPA after the end of the Period of Performance of the Task Order. The standard office software at EPA is MS Office. The standard GIS software at EPA is ESRI ArcGIS. Proprietary formats for watershed model files and data should be cleared with the Task Order Manager.

TRAVEL

Travel may be required under this TO. Any non-local travel must be approved by the TOM before travel is to take place.

CONTRACTOR IDENTIFICATION

Contractor personnel shall always identify themselves as Contractor employees by name and organization and physically display that information through an identification badge. Contractor personnel are prohibited from acting as the Agency's official representative.

The Contractor shall refer any questions relating to the interpretation of EPA policy, guidance, or regulation to the Task Order Manager.

REFERENCES

Baron, J. S. 2006. Hindcasting nitrogen deposition to determine an ecological critical load. Ecological Applications **16**:433-439.

Bobbink, R., K. Hicks, J. Galloway, T. Spranger, R. Alkemade, M. Ashmore, M. Bustamante, S. Cinderby, E. Davidson, F. Dentener, B. Emmett, J. W. Erisman, M. Fenn, F. Gilliam, A. Nordin, L. Pardo, and W. De Vries. 2010. Global assessment of nitrogen deposition effects on terrestrial plant diversity: a synthesis. Ecological Applications **20**:30-59.

Dise, N., Mike Ashmore , Salim Belyazid , Albert Bleeker , Roland Bobbink, Wim de Vries , Jan Willem Erisman , Till Spranger , Carly J. Stevens and Leon van den Berg. 2011. Nitrogen as a threat to European terrestrial biodiversity.*in* M. A. Sutton, editor. The European Nitrogen Assessment. Cambridge University Press, Cambridge.

McNulty, S. G., E. C. Cohen, J. A. M. Myers, T. J. Sullivan, and H. Li. 2007. Estimates of critical acid loads and exceedances for forest soils across the conterminous United States. Environmental Pollution **149**:281-292.

Moore, T. and J. Lynch. 2012. U.S. Critical Loads "Focal Center Utility Study" (FOCUS) Pilot Study Project: FOCUS Phase 1 Report.

Napelenok, S. L., D. S. Cohan, M. T. Odman, and S. Tonse. 2008. Extension and evaluation of sensitivity analysis capabilities in a photochemical model. Environmental Modelling & Software **23**:994-999.

Pardo, L. H., M. Fenn, C. L. Goodale, L. H. Geiser, C. T. Driscoll, A. E., J. Baron, R. Bobbink, W. D. Bowman, C. Clark, B. Emmett, F. S. Gilliam, T. Greaver, S. J. Hall, E. A. Lilleskov, L. Liu, J. Lynch, K. Nadelhoffer, S. Perakis, M. J. Robin-Abbott, J. Stoddard, K. Weathers, and R. L. Dennis. 2011a. Effects of nitrogen deposition and empirical nitrogen critical loads for ecoregions of the United States. Ecological Applications **21**:3049-3082.

Pardo, L. H., M. J. Robin-Abbott, and C. T. Driscoll. 2011b. Assessment of Nitrogen deposition effects and empirical critical loads of Nitrogen for ecoregions of the United States. General Technical Report NRS-80, U.S. Forest Service, Northern Research Station.